A Proposal to Design a 300 kton Water Cerenkov Detector for the Deep Underground Science and Engineering Lab

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1 Scientific Goals (~ 3 pages)

- **1.1 Neutrino Physics Bishai**
- **1.2 Proton Decay Kearns**
- **1.3 Cosmological Supernovae Smy**
- **1.4 Galactic Supernovae Scholberg**
- **1.5 Required Depth and Mass McKeown**

2 Detector Description (~4 pages)

- **2.1 Cavern Lande**
- **2.2 Containment Vessel Feyzi**
- **2.3 Water System Sobel**
- **2.4 Photodetectors Napolitano and Mountings Para**
- **2.5 Calibration System Smy**
- **2.6 High Voltage, Electronics, and Data Acquisition Kearns**
- **2.7 Support Facilities Kadel**
- **2.8 Sensitivity Factors Walter**
- **2.9 Cost Factors Rameika**

3 Proposal Goals (~6 pages) Svoboda

We propose to bring the concept of a 300 kton water Cerenkov detector for DUSEL to the level of a Preliminary Design.

Specifically, this will include:
an optimized detector conceptual design based on scientific priorities
development of technologies to improve sensitivity and decrease cost.
development of a Project Development Plan (PDP) in the first year
an Environmental Assessment (EA) or Environmental Impact Statement (EIS), as required
development of a bottoms-up cost and contingency analysis, with a WBS structure and dictionary
a detailed risk analysis
development of an initial construction schedule
development of a preliminary operations cost estimate
development of a plan for project management, including potential cooperation with other U.S. and international agencies

development of a Project Execution Plan (PEP)

We anticipate bringing the project to the level of a Conceptual Design after the Year 1, culminating in a Conceptual Design Review. Subsequently, the development to a full Preliminary Design would occur in
Year 2 and Year 3.

This project will require cooperation with the U.S. Department of Energy to provide the necessary neutrino beam from FNAL, and to provide engineering and scientific support from several national labs. Indeed, some crucial parts of the Preliminary Design are better accomplished by the DOE labs due to the nature and scope of the engineering requirements.

3.1 Development of a Conceptual Design Report

3.1.1 Detector Optimization/Conceptual Design Studies

3.1.1.1 Vertex Resolution and Particle Identification

Development of reliable detector simulation, background model, etc.

3.1.1.2 Is a Veto Necessary?

Need a background model

3.1.1.3 Gadolinium Doping

Work to develop concept for doping.

3.1.1.4 Water Cooling

Work to show if this is/is not necessary

3.1.1.5 Development of Specifications for a Near Detector

Work to specify size, location, resolution of Near Detector

3.1.1.6 Development of Specifications for a Calibration System

Work to develop specs for energy, vertex, PID calibrations

3.1.1.7 Development of Specifications for HV, Electronics, and DAQ

Work to develop specifications for these items

3.1.2 Technology Development

3.1.2.1 PMT Pressure Hardening

Work to ensure no PMT implosion chain reaction

3.1.2.2 Compensating Coil Specifications

Work to test magnetic sensitivity, measure in-situ

3.1.2.3 PMT Light Collection Enhancement

Work to investigate light concentrators, waveshifter plates

3.1.3 Development of an Initial Cost and Contingency Analysis

3.1.4 Development of an Initial Project Execution Plan

3.2 Development of a Preliminary Design Report

4 The Collaboration (~2 pages)

4.1 Experience Diwan

4.2 Cooperation with DOE Diwan

4.3 Cooperation with DUSEL S3 Organization Kadel

4.4 International Collaborators Svoboda

5 Proposal Management and Schedule (~3 pages) Diwan

6 Broader Impact (~2 pages) ?

6.1 Interdisciplinary Nature of Project

6.2 Postdoctoral Mentoring

6.3 Education

6.4 Public Outreach

As defined in the Large Facility Manual (NSF 07-38) for the MREFC program